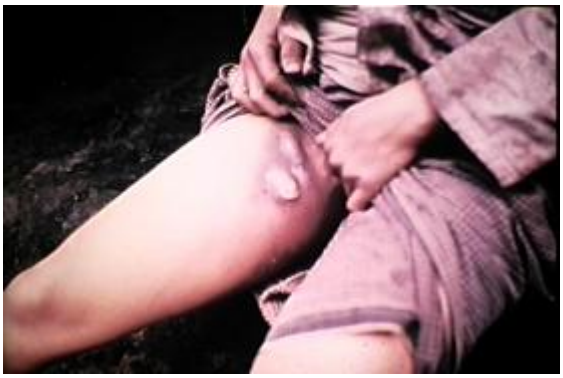
Plague Disease Investigation Plan

Disease and Epidemiology

Clinical Description:



Initial signs and symptoms may be nonspecific with fever (which is usually present), chills, malaise (tiredness), myalgia (muscle aches), nausea, prostration, sore throat, and headache.

- If the presentation is "bubonic", then lymph nodes in the inguinal (groin), axillary (armpit), and cervical (neck) areas may become swollen, inflamed, and tender, and may suppurate (discharge pus).
- The presentation may become "septicemic", where the organism becomes disseminated throughout the body including the meninges. Endotoxic shock and disseminated intravascular coagulation (DIC) may occur.
- If the presentation is "pneumonic", pneumonia may be present. Pneumonic plague is especially concerning from an infection control standpoint.
- Plague can also present as "pharyngeal", with an inflamed pharynx, or "meningitis", with nuchal rigidity.

Causative Agent:

Plague is caused by a bacterium known as *Yersinia pestis*. Yersinia species are Gram-negative rods that can exhibit a bipolar or "safety pin" staining pattern.

Differential Diagnosis:

Plague can be mistaken for influenza or other acute febrile illnesses.

Laboratory Identification:

Plague is generally identified via culture of blood, CSF, sputum, or exudate from the buboe. The laboratory should be notified if plague is suspected. Plague would be identified as a presumptive isolate at a clinical lab, and then forwarded to a reference lab or to the UPHL for final identification. All hospitals should be encouraged to report even SUSPECT cases of plague, as final identification can be a lengthy process.

Treatment:

The drug of choice is streptomycin, however this drug can be difficult to obtain. Gentamicin, doxycycline, ciprofloxacin, and chloramphenicol are alternative drugs. For cases involving meningitis, chloramphenicol is the drug of choice. For optimal efficacy, these drugs should be started within 8-18 hours after disease onset (especially for pneumonic plague). Reappearance of the fever following successful initial therapy may indicate a secondary site of infection. Treatment guidelines and post exposure

prophylaxis for possible mass casualty settings can be found in the cited JAMA article in the reference section.

Case Fatality:
The case fatality for untreated bubonic plague is 50-60%. Cases of untreated pneumonic or primary septicemic plague are invariably fatal. Appropriate therapy (if initiated early) will reduce the case fatality rate.

Reservoir:
Plague is a zoonosis involving rodents and their fleas. Plague is endemic in rodents throughout the southwestern United States. Ground squirrels are the natural vertebrate host, but it can also be found in rats, prairie dogs, rabbits, hares, wild carnivores, and domestic cats, as well as their fleas.

Transmission:
Typically plague occurs in humans from infected fleas or animals. The organism is transmitted via fleabites, or from bites, scratches, or respiratory droplets, or from handling infected tissues from infected wild or domestic animals. Humans who present with pneumonic plague can spread the disease through respiratory droplets. Humans with bubonic or septicemic plague cannot spread the disease through respiratory droplets, but care must be taken with contact precautions, as the pus from buboes is infectious.

Incubation Period:
The typical incubation period is 1-7 days, and varies with dose and routes of exposure.

Susceptibility:
All people are susceptible to this organism.

Epidemiology:
Approximately 12-14 human cases of plague are reported to the CDC each year in the United States. Utah has about 0.5 cases per year reported through public health. Plague would be considered an endemic zoonotic disease in Utah. In Utah, cats are frequently transmission vehicles. They acquire plague through hunting rodents, develop the disease, and then can transmit the disease.

Public Health Control Measures
Public Health Responsibility:
- Thoroughly investigate all suspect cases of disease
- Provide education to the general public, clinicians, and first responders regarding disease transmission and prevention
- Initiate active surveillance immediately upon notification of suspect cases

Prevention:
As this disease is a vectorborne illness, public health needs to assure that evidence of endemic activity (either through rodent or flea trapping) is swiftly remediated. Working through sister agencies (such as the Division of Wildlife Resources and the National Park Service) affected rodent burrows should be dusted with pesticides, and warning signs posted to campers/visitors. Information should reinforce not interacting with rodents, etc.

Vaccine:
No currently licensed vaccine is available.

Chemoprophylaxis:
Treatment guidelines and post exposure prophylaxis for possible mass casualty settings can be found in the cited JAMA article in the reference section.

Prevention in Healthcare Settings:
Contact and droplet precautions are advised for healthcare settings. Patients should be isolated until after 48 hours of appropriate antibiotic therapy. If patients do not have evidence of pneumonic plague, then contact precautions are appropriate.

Outbreaks:
Due to the serious nature of this disease, single cases will be investigated as soon as possible. Public health will assume that a single case could be leading to an outbreak and will react accordingly. Public health will have a large mission of public, clinician, and first responder education in the event of a real outbreak.

Isolation and Quarantine Requirements:
- As this is a disease that is not typically transmitted from person to person, isolation and quarantine are generally not appropriate.
- While the plague bacillus is labile and should not be considered an ongoing threat in an environmental setting. Therefore, no environmental quarantine is necessary.

Case Investigation
Reporting
Plague is an immediately reportable disease in Utah.

Case Definition
- Laboratory criteria for diagnosis
  - *Presumptive*
    Elevated serum antibody titer(s) to *Yersinia pestis* fraction 1 (F1) antigen (without documented fourfold or greater change) in a patient with no history of plague vaccination or
    Detection of F1 antigen in a clinical specimen by fluorescent assay
  - *Confirmatory*
    Isolation of *Y. pestis* from a clinical specimen or
    Fourfold or greater change in serum antibody titer to *Y. pestis* F1 antigen
- Case classification

- *Suspected*: a clinically compatible case without presumptive or confirmatory laboratory results
- *Probable*: a clinically compatible case with presumptive laboratory results
- *Confirmed*: a clinically compatible case with confirmatory laboratory results

Case Investigation Process

Suspect cases of plague should be investigated immediately, even if the cases haven't been confirmed. There are several immediate goals to the investigation process:

- **Notify the UDOH BOE and UPHL and the LHD by phone immediately.**
  - Do not leave a message on an answering machine; you must have a positive contact with an employee at each organization.
- **Actions taken with the case patient**
  - It is important to identify the source of each case. To do this, fill out both the disease investigation form as well as the BT investigation form. The possibility of bioterrorism needs to be ruled out as soon as possible.
  - Identify the type of disease. Is it septicemic, bubonic, or pneumonic?
  - Assure that the infection control precautions are appropriate for the type of disease.
- **Case contact management**
  - Plague is only transmissible from person to person if it is pneumonic.
    - IF the case is pneumonic, then rapid identification of close contacts to the patient from the date of symptom onset until after 48 hours of antibiotic treatment, AND post exposure prophylaxis of those contacts is essential.
  - Pneumonic plague is transmissible via droplets; therefore appropriate contacts should be notified.
  - Assure that contacts receive appropriate prophylaxis.
  - Monitor contacts daily. If any report development of a fever or cough for 7 days after exposure, they should be seen immediately by a clinician.

References

Control of Communicable Diseases Manual
Inglesby, et.al., Plague as a Biological Weapon, JAMA 283(17), 2000
Medscape Continuing Education – Terrorism and Disaster: What Clinicians Need to Know: Pneumonic Plague - 2005

D R A F T
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